Environmental Engineering lab (ECIV4152)
The Islamic University of Gaza
Civil Engineering Department
1st Semester 2011-2012

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Environmental Engineering Laboratory (ECIV 4152)
Answer the following questions
Time Allowed 90 Minutes

FINAL EXAM

الرقم الجامعي	اسم الطالب/ة

Question No.	Mark	Max. Mark	Notes
1		**20**	
2		**15**	
3		**10**	
4		**15**	
total		**60**	

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Question 1: (20 points)

For Each Question in the following , Choose the Correct Answer from the Multiple-Choice List.

No.	1	2	3	4	5	6	7	8	9	10
answer										
No.	11	12	13	14	15	16	17	18	19	20
answer										

1. Factors affecting on separation of suspended from dissolved solids

A. Porosity.
B. Thickness of the filter.
C. Particle size.
D. All of the above.

2. The hardness of water is mainly due to the presence of

A. Carbonate, bicarbonate, chlorides and sulfates of calcium and magnesium.
B. Carbonate, bicarbonates of calcium and magnesium.
C. Chlorides and sulfates of calcium and magnesium.
D. Nitrate and sulfates of calcium and magnesium.

3. For pure water at 25^{oC}, the product of [H^+]and [OH^-]ions is

A. 10^{-7}
B. 10^{-14}
C. 10
D. 10^7

4. The acceptable value of pH of potable water is

A. 6.5 to 8.5
B. 7.0 to 9.5
C. 6 to 8.5
D. 6.5 to 10

5. The concentration of residual chlorine in water is recommended(WHO)to be

A. 0.1 mg / litre
B. 0.2 mg / litre
C. 2.0 mg/litre
D. 2.5 mg/litre

6. The acceptable concentration of chloride in potable water (WHO) is

A. 150 mg/L
B. 250 mg/L
C. 500 mg/L
D. 1000 mg/L

7. The acceptable limit of nitrates in potable water is

A. 30 mg/L
B. 50 mg/L
C. 90 mg/L
D. 200 mg/L

8. The allowable limit of BOD of wastewater to be disposed in rivers is

A. 30 ppm
B. 70 ppm
C. 100 ppm
D. 300 ppm

9. Following indicator is used for Alkalinitydetermination of water

A. Bromo Cresol green indicator..
B. Potassium Chromate Indicator.
C. Erichrome Black-T indicator.
D. Bromthymol Indicator

10. Following indicator is used for chloride determination of water

A. Phenolphthalein.
B. Potassium Chromate Indicator.
C. Bromo Cresol green indicator.
D. Bromthymol Indicator.

11. Following indicator is used for determination of Calcium hardness

A. Murexide indicator .
B. Potassium Chromate Indicator.
C. Erichrome Black-T indicator.
D. Phenolphthalein.

12. Following indicator is used for determination of total hardness

A. Murexide indicator.
B. Potassium Chromate Indicator.
C. Erichrome Black-T indicator.
D. Bromthymol Indicator.

13. Turbidity is caused due to

A. The suspended particles.
B. The settleable particles.
C. The colloidal particles.
D. All of the above.

14. Water with hardness up to 50 ppm is known as

A. Hard water.
B. Soft water.
C. Moderately hard water.
D. Moderately soft water.

15. Excessive chlorine in water gives

A. Bad odor.
B. Bad taste.
C. Harmful effect.
D. All of the above.

16. The measurement of conductivity may lead to the estimation of

A. Total solids.
B. Total dissolved solids.
C. Suspended solids.
D. Colloidal solids.

17. Most common ion in the water is

A. Fluoride.
B. Nitrate.
C. Chloride.
D. Sulfate.

18. High chloride content in water

A. Harms metallic pipes.
B. Harmful for irrigation.
C. Harmful to human beings.
D. All the above.

19. Which water generally has high nitrate concentration?

A. Surface water.
B. Ground water.
C. Distilled water.
D. None of above.

20. The anaerobic decomposition leads to gases like

A. CO_2
B. CH_4
C. SO_2
D. NO_2

Question 2: **(15 points)**

Study the following statements & indicate if they are (**True or False**)

No.	1	2	3	4	5	6	7	8	9	10
Answer										
No.	11	12	13	14	15					
Answer										

1. Total suspended solids are the portion that passes through the filter of 2µ m or smaller.
2. Conductivity is customarily reported in micromhos per centimeter.
3. Total solids equal the fixed solids and dissolved solids.
4. The measurement of pH is universally done using electronic pH meters.
5. The chloride concentration in sewage is less than the water supplied.
6. Chlorine is the most common ion in the water and gives the salty taste to water.
7. The most common testing method for hardness is the titrimetric method.
8. The temporary hardness is due to Chlorides of calcium and magnesium
9. The high nitrate concentration of water fed to infants causes Green baby disease.
10. Disinfection means Killing of disease producing bacteria and other microorganisms.
11. Graduated yellow to brown colour produced by the Nessler-ammonia Reaction.
12. Organic waste in sewage is one of the major types of water pollutants.
13. Respirometric method is the standard method for measuring COD.
14. In COD methodology, a strong oxidant $K_2Cr_2O_7$ in acidic media is used for the digestion of the sample at 100^o.
15. COD is used as a measurement of pollutant in wastewater and natural waters.

Question 3: **(10 points)**

A) Answer the following question:

1. Name two methods to measure the turbidity in the laboratory?
2. What are different forms of Nitrogen?
3. Distinguish between BOD and COD? Which is higher? And why?
4. Write the main components of a titration method including the main apparatus used in titration?

B) Define

1. PH
2. Electrical Conductivity
3. Fixed solids

Question 4: (15 points)

(i) A 150-ml sample of water is titrated with 0.01 N HCL. The initial pH is 11, and 20 ml of acid is required to reach the pH 8.3 endpoint. An additional 16 ml is required to reach the 4.5 endpoint. Determine the species of alkalinity presented and the concentration of each species.

(ii) 2mL of wastewater sample was diluted to 1 L. Aerated and seeded. The dissolved oxygen content was 7.8 mg/L initially. After 5 days, the dissolved oxygen content had dropped to 5.9 mg/L. What is the ultimate BOD? Assume the rate constant, k, to be 0.23 days^{-1}. Then find the dissolved oxygen content after 20 days?

(iii) The following absorption vales were recorded to the standard solutions of Nitrates:

Concentration (mg/l)	**absorption**
2.5	0.19
5	0.35
10	0.73
15	1.11
20	1.50

Explain the laboratory procedure for nitrates determination? Then find the concentration of a sample that has 2.1 absorption?

Useful Formula

$$P, Alkalinits(\frac{mg}{L})_{as\ Caco3} = \frac{V_{Acid} \times N_{Acid} \times 50000}{V_{Sample}}$$

$$T, Alkalinits(\frac{mg}{L})_{as\ Caco3} = \frac{V_{Acid} \times N_{Acid} \times 50000}{V_{Sample}}$$

$$BOD = L_0(\ 1 - e^{-Kt}) \qquad BOD = \frac{D_i - D_f}{P}$$

Result of Titration	Hydroxide (OH)	Carbonate (CO_3^{2-})	Bicarbonate (HCO_3^-)
P = 0	0	0	T
2P < T	0	2P	T - 2P
2P = T	0	2P	0
2P > T	2P - T	2(T - P)	0
P = T	P	0	0